RISK-RETURN CHARACTERISTICS OF U.S. HOTEL REITs

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By
Rongzhu, Yang
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Abstract

Real Estate Investment Trusts (REITs) have become common in the global equity market. The growth and emergence of hotel REITs as viable investment vehicles has followed an upward trend since 1993. Despite the growing importance of the REIT structure in the hotel industry, the risk-return characteristics of hotel REITs, and their performance are still insufficiently understood. This paper explores the relationship between hotel REIT return and market return, size factor, book-to-market equity factor, investment factor and profitability factor, using the Fama-French three-factor and five-factor model. In addition, this paper adds a new factor: the return of online consumer review ratings. Recently, the importance of online consumer review ratings on third party sites has received considerable attention. Studies have found that high online consumer review ratings lead to high aggregate firm performance and high pricing power. However, these studies remain at the company performance level. This paper provides an alternative perspective, investigating the impact of online consumer review ratings on hotel REIT return. The study first demonstrates that hotel REIT return is strongly related to market return. The study then shows that size, book-to-market equity, investment and profitability factors have no significant impact on REIT return. Finally, the return of online consumer review ratings was added to the Fama-French three-factor and five-factor models, demonstrating that online consumer review ratings have greater influence on limited service hotels than on full service hotels; online consumer review ratings have greater influence on low-star level hotels than high-star level hotels.

Biographical Sketch

Rongzhu (Lucy), Yang was born in TianJin, China. She received her Bachelor of Science in Casino Management from University of Macau in July 2010. She worked in Venetian Macau and Las Vegas Sands, the two leading integrated casino resorts in the world. She was the teaching assistant in various casino and hospitality courses at University of Macau. She entered the Master of Science in Hotel Administration program at Cornell in August 2012. Her major concentration is revenue management and minor concentration is real estate.

Acknowledgments

The journey towards the completion of my master degree has had many best moments in my life. Aside from the efforts, strength and motivational quotations that kept me going for the past five years, this success was made possibly largely due to the encouragement, guidelines and support from many people. Hence, I am taking this opportunity to express my highest gratitude to those who have been instrumental in this completion and making my master journey a magnificent experience.

My debt of gratitude goes to my advisors Professor Chris Anderson and Professor Benjamin Lawrence for their unflagging encouragement, immeasurable guidance, sincerest attention, genuine caring and concern that are necessary for my survivorship in the master program and subsequently in the completion of my master degree. Their approaches and faith in students has taught me humility, selfless attitude, how to care and understand others' needs that I would carry along in my life. They have their own unique way in motivating students to prioritize what matters in our lives and not only acts as advises but "fatherly figure" that serves as an important role model. Admittedly, the opportunities they offered to me from acceptance into the master program to working with them on research projects and many other have contributed immensely to my personal and academic life at Cornell. I would never have developed the confidence that I have and achieve these milestones without their guidance.

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Nomenclature

R_{it} = excess return on stock i for time period t

Rf_t = return of risk free rate at time t

Rm_t = return on the value-weight (VW) market portfolio at period t

SMB_t = return on a diversified portfolio of small stocks minus the return on a diversified portfolio of big stocks at period t

HML_t = difference between the returns on diversified portfolios of high and low B/M stocks at period t

RMW_t = difference between the returns on diversified portfolios of stocks with robust and weak profitability

CMA_t = difference between the returns on diversified portfolios of low and high investment stocks, which are called as conservative and aggressive stocks

Rev_{it} = aggregated online review of REIT i at time t

Rev_{it-1} = aggregated online review of REIT i at time t-1

Rev_{it-2} = aggregated online review of REIT i at time t-2

Rev_{it-3} = aggregated online review of REIT i at time t-3

SL_i = average star level of hotels owned by REIT i

PI_i = percentage of limited-service hotels owned by REIT i

e_{it} = a zero-mean residual

M_t = stock price at time t

D_{t+k} = dividend at time t+k

r = internal rate of return on expected dividend

Y_{t+k} = equity earning at time t+k

dB_{t+k} = change in book equity at time t+k

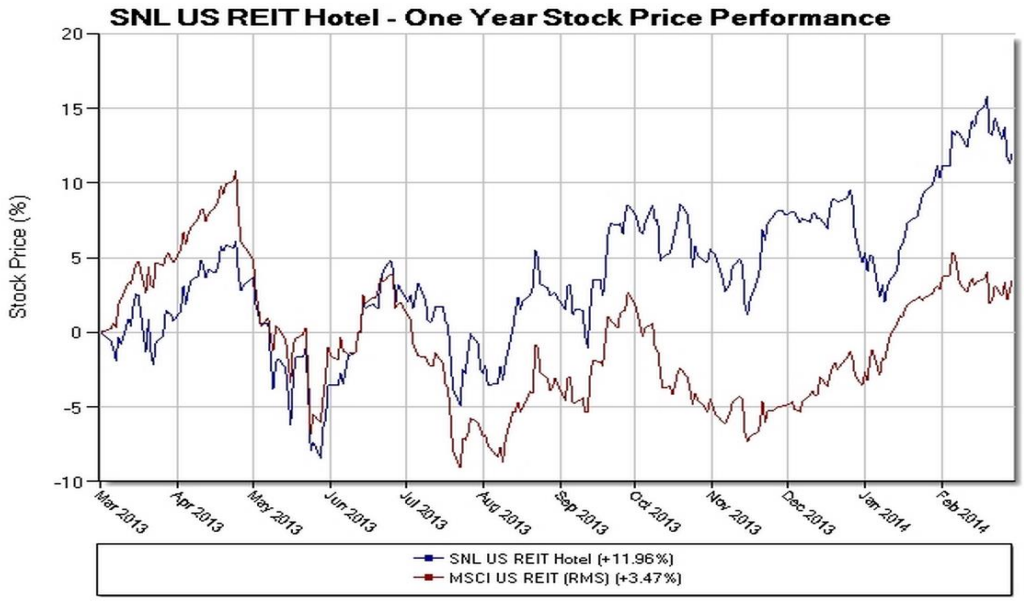
Chapter 1: Introduction

The Real Estate Investment Trust (REIT) has become a common vehicle in the global equity market. A REIT is an investment vehicle that invests primarily in income-producing real estate. It is usually publicly owned and traded. In order for a company to qualify as a REIT it must meet the rules of the Internal Revenue Code. These rules include: investing at least 75% of total assets in real estate; deriving at least 75% of gross income as rents from real property or interest from mortgages on real property; and distributing at least 90% of taxable income to shareholders in the form of dividends annually.

Although REITs in the United States were authorized by federal legislation in 1960 (Zietz, Sirmans, & Friday, 2003), hotel-specific REITs are a relatively new phenomenon. In 1993 there were only two hotel REITs with a total market capitalization of approximately $100 million (Jackson, 2008). From August 1993 to August 1996, $1.4 billion was raised in the initial public offerings of 13 hotel REITs (Burch and Taylor, 1997). The number of publicly traded U.S. hotel REITs had increased to 17 firms with a total market capitalization of $8.8 billion (Grupe and DiRocco, 1999). The growth of hotel REITs during the 1990s has significantly increased the capital flow into the hotel industry and, in turn, changed the structure of hotel real estate ownership. Five percent of hotel real estate in the U.S. is now owned by hotel REITs (Legg Mason Wood Walker, Inc., 1999).

As shown in Figure 1, the U.S. hotel REIT market has demonstrated strong growth from 2013 to 2014 and outperformed the U.S. REIT average.

Figure 1: U.S. Hotel REIT Market (March 2013 to Feb 2014)



Despite the growing importance of the REIT structure in the hotel industry, the risk-return characteristics of hotel REITs and their performance are still insufficiently understood. Only a few studies (e.g. Jackson, 2009; Kim et al., 2002a, b) have addressed the issue, and their findings are limited because they use single-factor CAPM with only market return as an independent variable. Previous real estate and general REIT studies (e.g. Chan et al., 1990; Chen and Peiser, 1999; Titman and Warga, 1986) suggested that the single-factor asset pricing model may not be appropriate for understanding the risk, return, and performance of real estate assets because there are factors other than single market risk underlying the return-generating process in real estate, such as market capitalization of a REIT.

This paper fills that gap by applying the Fama-French three-factor and five-factor model that includes market return (S&P 500), size (market capitalization), book-to-market equity ratio (book value of the equity to the market value of equity), profitability (gross

profits to assets) and investment (growth of total assets for the fiscal year ending in t-1 divided by total assets at the end of t-1). Peterson and Hsieh (1997) found that equity REIT risk premiums are significantly related to the market, size, and BE/ME factors. There is much evidence that firms with higher book-to-market ratios have higher average stock returns (Rosenber et al., 1985; Chan et al., 1990; Fama and French, 1992; Capaul et al., 1993). Haugen and Baker (1996) found that average returns are positively related to profitability controlling for book-to-market equity. Fairfield et al. (2003), Richardson and Sloan (2003), and Titman et al. (2004) found a negative relationship between average returns and investment. Piotroski (2000) and Griffin and Lemmon (2002) showed that composite measures of firm strength (proxies for expected net cash flows) are positively related to future stock returns.

This paper proposes a new factor that could potentially explain the variation in REIT returns: return of online consumer review ratings. Online consumer review ratings have played an increasingly important role in consumers' purchasing decisions because online reviews have both global presence and enduring content. An industry report from Market Metrix[1] shows that word-of-mouth has become one of the important factors in the hotel selection decision (Barsky & Nash, 2008). Eighty-four percent of people reported that what they see at online travel sites influences their hotel purchase choice and the reviews have larger impact than other features of the hotels (Milan 2007). Similarly, comScore and Kelsey Group (2007) showed that 87% of customers stated that a review

[1] Market Metrix works with more than 14,000 hotels and casinos in more than 70 countries to collect guest feedback and turn it into performance and results. See more at: http://corp.marketmetrix.com/what-we-do/overview/#sthash.W7NvxBaS.dpuf

generated by a fellow customer had a significant impact on their hotel purchase decision, and 40% of people who consulted an online review of hotels subsequently stayed at that hotel. Vermeulen and Seegers (2009) found that exposure to online reviews increases both hotel awareness and hotel consideration. The impact of online consumer review ratings is reflected from two perspectives: increasing a firm's pricing power and increasing sales. High online consumer review ratings signal that the sellers are trustworthy. Thus, review ratings reduce information asymmetry between the seller and the buyer, and high customer ratings from past customers create a price premium for making online transactions less risky (Ba and Pavlou, 2002). Furthermore, the study conducted by comScore and the Kelsey Group (2007) reported that customers are willing to pay more for a higher-rated service in return for higher-quality service. Previous studies demonstrated that there is a significant positive relationship between an online product rating and successive sale of the product on that site (Chevalier and Mayzlin, 2006; Dellarocas et al., 2007). Ogut and Tas (2012) found that room sales are significantly higher for hotels with higher customer ratings controlling for location, size and price. Anderson (2012) showed that high online consumer review ratings lead to high ADR and RevPar performance and high pricing power.

As discussed above, high online consumer review ratings increase a hotel's pricing power and sales, which ultimately leads to strong revenue performance. Strong revenue performance signals high dividend payout potential. According to Equation (1), the market value of a firm is the present value of future dividends. High future dividends result in a high market value of a firm's stock.

Equation (1) $M_t = \sum_{k=1}^{\infty} \frac{E(D_{t+k})}{(1+r)^k}$

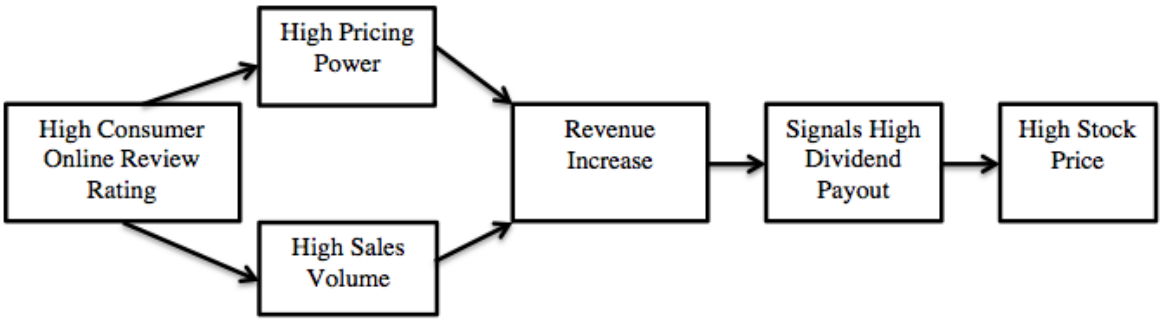
M_t = the price at time t

D_{t+k} = dividend at time t+k

r = internal rate of return on expected dividend

Therefore, strong revenue performance leads to a high market value of the firm and a high stock price. The relationship is displayed in Figure 2.

Figure 2: Relationship between Online Consumer Review Ratings and REIT Return



The empirical study deals with 16 hotel REITs and 563 hotels by merging monthly review data provided by ReviewPro and a list of hotel REITs from SNL financial database. The 16 REITs are all traded on the New York Stock Exchange (NYSE). The 563 hotels are located in 42 U.S. states. The property types include full-service hotels and limited-service hotels. The empirical findings yield important insights. First, I demonstrate that a hotel REIT return is strongly related to market return due to the highly cyclical and volatile nature of the hotel industry. Second, I add the return of online review ratings into Fama-French three-factor and five-factor models and find that the review return has no significant impact on REIT return. Third, I demonstrate that online consumer review ratings have greater influence on limited-service hotels than on full-service hotels. Online consumer review ratings have greater influence on low-star hotels than on high-star hotels. Finally, I

examine the impact of lagged review return on REIT return and find no significant relationship between lagged review return and REIT return.

This paper contributes to the existing literature in several ways. First, this paper is the first to apply the five-factor asset-pricing model in the hotel REIT sector. Second, this study introduces a new factor (return of online consumer review ratings) that explains the variation in REIT return. Third, existing online review studies examine performance at the company level. This paper takes an alternative perspective by investigating the impact of online consumer review ratings on hotel REIT return.

Chapter 2: Literature Review and Research Hypotheses

This paper's literature review and research hypotheses consist of two parts. In the first part, I introduce the capital asset pricing model, including the CAPM single-factor model, Fama-French three-factor model, and Fama-French five-factor model. I then discuss the existing studies that examine the risk-return characteristics of hotel REITs. In the second part, I discuss the importance of online consumer review ratings. I then explain the impact of online consumer review ratings on REIT returns. Finally, I examine the moderating role of property type and star level in explaining the relationship between review and REIT performance.

Part 1: 2.1: Capital Asset Pricing Model

2.11 CAMP Single-Factor Model

The capital asset pricing model (CAPM) is widely employed in the financial literature. It provides predictions about how to measure risk and the relationship between expected

return and risk. Sharpe (1964) and Lintner (1965) marked the beginning of the capital asset pricing model (CAPM) as shown in Equation (2). They assumed that, in a perfectly efficient market, asset return is not predictable from public information and past performances. Therefore, the cross-sectional variations in asset returns are attributed to risk premiums required by investors for taking the risk in investing in an asset. Since the mid-1960s, a tremendous amount of research has been devoted to CAPM.

Equation (2) $$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t)$$

2.12 Fama and French Three-Factor Model

Fama and French (1992) found that the cross section of average returns on U.S. common stocks had little relation to the market beta, and they proposed that variables such as size, leverage, earnings/price (E/P), and book-to-market ratio have reliable power to explain the cross-section of average returns. Used alone or in combination with other variables, the market beta (b_i) has no impact on a stock's return. Used alone, size, E/P, leverage, and book-to-market have explanatory power. Fama and French (1992) derived a three-factor as shown in Equation (3).

Equation (3) $$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t) + s_i SMB_t + h_i HML_t + e_{it}$$

SMB (small minus big) represents variances in stock returns that are due to size (price per share multiplies number of shares outstanding). It is believed that management could earn an abnormal return by investing in small capitalization stocks. HML (high minus low) captures variances in stock returns that are due to BM/ME (the book-to-market ratio). If the ratio is above 1, the stock is undervalued; if it is less than 1, the stock is overvalued. The

higher the ratio, the more the stock is undervalued. Investing in undervalued assets is believed to generate higher returns.

Peterson and Hsieh (1997) found that equity REIT risk premiums are significantly related to the market, size, and BE/ME factors. Clayton and MacKinnon (2003) found that the influence of small-cap stock factors on REIT returns generally increased, whereas the influence of large-cap stocks decreased. Anderson et al. (2005) showed that small-cap "value" returns (i.e. high BE/ME equity ratio) account for the largest portion of REIT return volatility.

2.13 Fama and French Five-Factor Model

A recent study by Fama and French (2013) further extended the three-factor model to a five-factor model by adding a profitability factor and an investment factor. The rationale is that B/M is a noisy proxy for expected returns because the market value of a stock also reflects forecasts of profitability and investment. To better isolate the information in stock prices that is about expected returns, profitability and investment factors are added to the three-factor model as shown in Equation (4). Fama and French (2006) illustrated the intuition that book-to-market and profitability are both positively related to expected returns by using a dividend discount model. A recent paper by Novy Marx (2012) identified a proxy for expected profitability that is strongly related to average return. Aharoni et al. (2013) found a weaker but statistically reliable relationship between investment and average return. Profitability is the ratio of a firm's gross profits (revenues minus the cost of goods sold) to its assets. Investment is the growth of total assets or book

equity for the fiscal year ending in t-1 divided by total assets or book equity at the end of t-1.

Equation (4)

$$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t) + s_i SMB_t + h_i HML_t + r_i RMW_t + c_i CMA_t + e_{it}$$

Recall that in Equation (1), the dividend discount model, the market value of a company's stock is the present value of expected dividends. Given that a dividend at time t equals equity earnings (Y_t) minus the change in book equity (dB_{t+k}), I replace $E(D_{t+k})$ with $E(Y_{t+k} - dB_{t+k})$ and derive Equation (5).

Equation (5)

$$M_t = \sum_{k=1}^{\infty} \frac{E(Y_{t+k} - dB_{t+k})}{(1+r)^k}$$

Dividing book equity Bt on both sides, I derive Equation (6).

$$\frac{M_t}{B_t} = \frac{\sum_{k=1}^{\infty} \frac{E(Y_{t+k} - dB_{t+k})}{(1+r)^k}}{B_t}$$

Controlling for M_t/B_t and expected growth in book equity due to reinvestment of earnings, firms with higher expected earnings (Y_t) have higher expected returns. Controlling for M_t/B_t and expected earnings, firms with higher expected growth in book equity due to reinvestment of earnings have lower expected stock returns. Therefore, theoretically speaking, high expected earnings result in high expected returns. High investment results in low expected returns.

Several studies have investigated the relationship between stock return and investment. Fairfield et al. (2003), Richardson and Sloan (2003), Titman et al. (2004) and Cooper et al. (2008) documented a negative relationship between current investment and future returns. An extensive literature by Sloan (1996) showed that accruals are negatively related to future profitability and that higher accruals predict lower stock returns (See Xie, 2001; Fairfield et al., 2003; Richardson et al., 2004, 2005; Chan et al., 2006). The literature on the profitability factor includes Haugen and Baker (1996) and Cohen et al. (2002). These studies found that, controlling for book-to-market equity, average returns are positively related to profitability. Research that documents the combined effect of investment and profitability factors includes: Abarbanell and Bushee (1998), Frankel and Lee (1998), Dechow et al. (2000), and Lee et al. (2004). These studies combined analysts' forecasts of earnings with assumptions about future investment to estimate expected stock returns. Their common finding is that higher expected net cash flows relative to current market value forecast higher stock returns. Piotroski (2000) and Griffin and Lemmon (2002) showed that composite measures of firm strength (proxies for expected net cash flows) are positively related to future stock returns.

2.14 Behavior Finance Factors

Other factors discussed in the literature but not considered in this paper include the momentum effect and investor sentiment. The momentum effect means that stocks whose prices have increased in the past will continue outperforming in the future, while stocks whose prices decreased in the past will continue performing poorly. Hong et al. (2000) found that momentum strategies are more profitable when they are implemented on stocks

with lower market capitalizations and, controlling for firm size, the momentum effect decreases with analyst coverage. Daniel and Titman (1999) documented that the momentum strategy works better among stocks with lower book-to-market ratios. Lee and Swaminathan (2000) found that momentum profits are higher for stocks with higher turnover. Investor Sentiment says that when investors are optimistic, REIT returns become higher. Lin et al. (2009) show that when investors are optimistic (or pessimistic), REIT returns becomes higher (or lower). Lee et al. (1991), Swaminathan (1996) and Neal and Wheatley (1998) found that investor sentiment significantly relates to asset returns. The common characteristic of these two factors is that they both fall under the scope of behavioral finance.

Part 1: 2.2 Hotel REIT Risk-Return Characteristics

Studies of hotel REITs have yielded a variety of findings. Mueller and Anikeeff (2001) and Imperiale (2002) found that hotel REITs have the highest return and volatility of all REIT property sectors. The overall performance of hotel REITs has been one of the best compared to other REIT asset classes (Imperiale, 2002). Kim et al. (2002a) examined the performance of hotel REITs from 1993 to 1999 by using the Jensen index (Jensen, 1968) and found that overall hotel REIT performance was similar to that of the overall REIT portfolio as well as the market portfolio. When compared to other types of equity REITs, hotel REITs' performance was inferior to that of other types (office, industrial, residential and diversified REITs). The finding also showed that hotel REITs performed similarly to healthcare and retail REITs.

Kim and Gu (2003) investigated factors affecting unsystematic (i.e. firm-specific or diversifiable) risk. Jackson (2008) researched the relative performance of hotel REITs

using the same methodology but for a longer period. Sarheim (2006) examined the performance of hotel REITs compared to C-Corporations and S&P 500 companies from 2000 to 2005, five years during which the U.S. hotel industry was affected by several significant events including a weak economy in 2000, the terrorist attack in 2001, the SARS epidemic, and the Iraq war. Overall, hotel REITs were found to be resilient during this period.

Although existing studies on this subject are limited, there has been general agreement regarding the risks and returns of hotel REITs. First, beta estimates for hotel REITs have always been statistically significant regardless of the market proxy (such as the S&P 500 or REIT index) used in the model (Jackson, 2009; Kim et al., 2002a, b). The significant beta estimates suggest that market factors affect the returns on hotel REITs. The relatively high beta estimates may also reflect the highly cyclical and volatile nature of the hotel industry. Second, alpha (the intercept) estimates of hotel REITs were not significantly higher or lower than zero (Jackson, 2009; Kim et al., 2002a, b). This means that hotel REITs neither outperform nor underperform the overall stock market on a risk-adjusted basis.

Part 2: 2.3 Importance of Online Consumer Review Ratings

Word of mouth is an informal communication among consumers about products and services (Liu 2006). It has a powerful influence on consumer behavior (Anderson 1998; Mahajan et al., 1990; Goldenberg et al., 2001; Stokes and Lomax, 2002; Zhu and Zhang 2006). Its influence was further enhanced by the rapid growth of the Internet and social media (Utz et al., 2011) as individuals can now make their opinions easily accessible to other Internet users (Dellacocas, 2003). One type of online WOM is the reviews that appear

on a peer review site or online retailer review site. Consumers use online reviews to reduce perceived risk by searching for information before purchasing products (Srinivasan and Ratchford, 1991; Zhu and Zhang 2010). After a purchase has been made, online reviews offer a convenient way for consumers to comment on their purchases, complain about their dissatisfaction and share details of their purchases with friends. Due to the popularity and influence of online review activities, more and more companies are offering online review services to receive feedback from customers in various industries such as motion pictures (Fattach 2011), television networks (Duan et al., 2008) and online retailing (Dellarocas, 2006). The aggregation and presentation of these user reviews has become a viable business model. Companies treat online reviewing as a marketing tool through which to execute business strategies (Litvin et al., 2008) by posting product information and sponsoring events in online communities (Mayzlin 2006). Some companies issue managerial responses to mollify dissatisfied customers (Ye et al., 2008) or even manipulate online reviews strategically to influence purchase decisions (Dellarocas 2006).

The hospitality industry is one of the fast growing areas of online review activities (Ye et al., 2009; Yoo & Gretzel, 2011). TripAdvisor provides 75 million reviews generated by 32 million users (Tripadvisor.com). Word of mouth is particularly important for experience goods such as hotel stays due to their intangible nature (Litvin et al., 2008). Hotel product offerings cannot be evaluated before consumption and cannot be returned after starting the experience, making interpersonal influence more important. The consumption of hotel products is also viewed as high risk due to its intangible nature, so consumers tend to rely on the evaluation of a reference group to reduce their risk (Sparks and Browning, 2011). The hotel product is also seasonal and perishable, so consumers have

a tendency to seek recent reviews (Dalbor and Andrew, 2000). According to Gretzel and Yoo (2008), three-quarters of travelers have considered online consumer reviews as an information source when planning their trips, and travel reviews are often perceived as more likely to provide up-to-date, enjoyable and reliable information than content posted by travel service suppliers. Pan et al. (2007) also stated that online reviews are perceived as an important source of information to travelers.

Part 2: 2.4 Impact of Online Consumer Review Ratings on REIT Performance

Recalling the relationship in Figure 2, I propose that favorable online consumer review ratings lead to high sales volume and high pricing power, the combination of which leads to revenue increase. Revenue increase, in turn, signals high dividend payout. As shown in the dividend discount model in Equation (1), the market value of a firm is the present value of its future dividend. Therefore, high online consumer review ratings ultimately lead to high stock prices.

2.41 High review rating leads to high sales volume

According to Alba and Chattopadhyay (1986), online reviews have two effects on customers' booking decisions: awareness effect and persuasive effect. The awareness effect improves customers' cognitive load toward hotels by enabling customers to read other people's reviews. On the other hand, the persuasive effect encourages customers to make a purchase decision. Most risk-averse customers prefer to choose hotels favored by others. A high rating of the product presents high satisfaction and better product quality, which reduces the risk of selection. Vermeulen and Seegers (2009) showed that exposure to online reviews increases both hotel awareness and hotel consideration. Therefore, it is

reasonable to propose that higher online consumer review ratings lead to higher sales volume.

The majority of online review studies focus on examining the impact of consumer reviews on peers and, in turn, sales volume (Senecal and Nantel, 2004; Chevalier and Mayzlin, 2006; Li and Hitt, 2008, Cheung et al., 2009). For instance, Chevlier and Mayzlin (2006) investigated the impact of online consumer reviews on book sales at Amazon and found that online reviews significantly influenced book sales. Ghose and Ipeirotis (2007) tested the influence of online reviews on a variety of products and found that online reviews could reduce cognitive loads of readers and thus lead to greater sales. Godes and Mayzline (2004) showed a positive relationship between online word-of-mouth communication and television show viewership. Liu (2006) studied movie reviews and found that online movie reviews offer significant explanatory power for both aggregated and weekly box office revenues. Resnick and Zeckhauser (2002) found that sellers with better reputations are more likely to sell their items but they enjoy no boost in price because of favorable reviews.

Other studies examine the value of various metrics of online review ratings in influencing and predicting future sales (Chen et al., 2004; Clemons et al., 2006; Goldstein and Goldstein, 2006; Liu, 2006; Dellarocas et al., 2007; Duan et al., 2008; Park and Kim, 2008). For example, Dellarocas et al. (2007) demonstrated that online movie ratings significantly improved the predictive power of a revenue forecast model. Additionally, Goldenberg et al. (2001) found that consumers' decision-making processes were strongly influenced by online reviews. Chevalier and Mayzlin (2006) found that online amateur book ratings affected consumers' purchasing behavior. Senecal and Nentel (2004) conduced an online experiment and showed that participants who consulted product

recommendations selected recommended products twice as often as those who did not consult recommendations. Industry report confirms these findings by revealing that 87% of customers stated that a review generated by a fellow customer had a significant impact on their hotel purchase decision and 40% of those who consulted an online review of hotels subsequently stayed at that hotel (comScore; Kelsey Group, 2007).

2.42 High review ratings lead to high pricing power

The economics literature defines price premiums as prices that yield above-average profits (Klein and Leffler, 1981; Shapiro, 1983). In this paper, a price premium is defined as the monetary amount above the average price received by multiple sellers that offer a similar product during a finite period (Ba and Pavlou, 2002). For example, two hotels that have rooms of similar quality may charge different prices. Price premiums are critical to the survival and success of online marketplaces since lack of differentiation would force high-quality room sellers to flee the marketplace since their quality could not be signaled and rewarded (Akerlof 1970).

Price premiums result from a customer's willingness to pay an extra amount to reputable sellers to reduce transaction risks (Rao and Monroe, 1996). Therefore, in an efficient market with dynamic pricing, buyers are willing to compensate reputable sellers with price premiums to assure safe transactions. On the other hand, buyers will penalize sellers of questionable reputation with a price discount because they must assume above average transaction-specific risks. To conclude, differences in perceived reputation and credibility cause price premiums and discounts. Based on this argument, a buyer's trust in a seller's credibility reduces perceived transaction-specific risks, allowing the seller to

obtain price premiums. High online consumer review ratings signal that a seller is trustworthy. Thus, review ratings reduce information asymmetry between the seller and the buyer, and high customer ratings from past customers create a price premium for making online transactions less risky (Ba & Pavlou, 2002). Furthermore, the study conducted by comScore and the Kelsey Group (2007) reported that customers were willing to pay more for a higher rated service in return for higher quality service. Baker and Crompton (2000) found that customers who value quality were willing to pay more for it. Similarly, Recnick et al. (2006) found that a higher level of trust in a seller's reputation provided an opportunity for the seller to propose a higher price premium to buyers. Lee et al. (2011) found that when trust in online shopping malls is high, consumers' purchase intentions are more influenced by favorable online reviews than by online advertisements.

Given that higher online consumer review ratings increase sales volume and pricing power, which leads to higher revenue. Strong revenue performance signals future growth potential and the ability to pay out higher dividends. Stock price equals the present value of a future dividend. Therefore, I propose the following hypothesis:

H1: Online consumer review ratings have a positive impact on REIT stock returns.

Part 2: 2.5 Moderating Role of Hotel Property Type and Star Rating

Homogeneous products (commodity products) such CDs and electronics have easily discernible quality levels. The perception of quality of heterogeneous products such as used cars differs from consumer to consumer. According to Chung et al. (2009), lack of accessible information about product quality causes product quality uncertainty. If the quality of a product is homogeneous and therefore easy to determine, the perceived risk involved in the purchase is relatively low. Conversely, a consumer's perceived uncertainty

will increase if product quality is heterogeneous and difficult to assess. Kim et al. (2008) proposed that the degree of product heterogeneity influences consumers' shopping behavior as a moderator and showed that the relationships between interactivity and trust, trust and utilitarian shopping value, and interactivity and hedonic shopping value are significantly influenced by product heterogeneity. Yang et al. (2012) used empirical data from the motion picture industry and found that online reviews have a significant effect on box office revenue only in the case of non-mainstream movies, which have relatively smaller marketing budgets than mainstream movies. These findings suggested that as marketing communication channels become more diverse with larger marketing budgets, more information about a movie reaches customers and the effect of online reviews is weakened. Choe et al. (2007) investigated moderating effects of product heterogeneity on online consumer behavior and found that the perceived risk increases when consumers shop for highly heterogeneous products.

Signaling theory states that people search for referential information when they have to make a decision and face uncertainty. Therefore, the informative effect of online reviews will be stronger for lesser-known hotels. Star rating and property type are two reliable signals of quality because they are official industry standards that distinguish hotel facilities, quality of infrastructure, and service provided by the hotels. For example, full-service hotels often need larger staffs and larger facilities to accommodate guests who require more luxurious amenities and offer a variety of services including bed turn-down, newspaper delivery, security guards, wake-up calls, room service, and a shuttle to and from an airport or nearby attractions. Conversely, limited-service hotels usually have low operating costs and room rates while offering few services: Guests get a room for the

night. In addition, a hotel's star rating and property type are relatively objective measures compared to information displayed on a hotel's website and in advertisements. Most importantly, star rating and property type are related to price, meaning that customers will trade off quality against expenditure. This links to the argument that consumers are willing to pay a price premium for a high-quality product. It is easy for customers to predict that a five-star hotel (full-service hotel) will provide better service than a one-star (limited-service) hotel. Furthermore, even if a five-star (full-service) hotel has several negative reviews, customers may still feel confident about the service quality and consider the negative reviews as biased or a temporary service gap. Because the star level and property themselves provide additional information, the effect of an online review on performance is weakened. Because customers cannot guarantee the service quality from a low-star (limited-service) hotel, customers' reviews have significant informative and persuasive effects. Lu et al. (2014) investigated the moderating role of hotel star ratings on the relationship between online reviews and hotel sales and found that average rating of online reviews had a significant impact on sales and the effect was further moderated by a hotel's star rating. Since customers have less information about low-star-rated hotels and limited-service hotels and the perceived risks of those are high, customer reviews should be more helpful and informative for these than for high-star, full-service hotels. Therefore, I propose the following two hypotheses:

H2: Online consumer review ratings have more impact on limited-service hotels than on full-service hotels.

H3: Online consumer review ratings have more impact on low-star hotels than on high-star hotels.

Chapter 3: Data and Methodology

3.1 Data

This study's monthly review data is provided by ReviewPro and covers the period from February 2011 to December 2013. ReviewPro aggregates hundreds of millions of social media mentions in over 35 languages from Online Travel Agencies (OTAs), review websites, and social media platforms. The company's GRI is an aggregate online reputation score for an individual hotel, group of hotels, or hotel chain. It is based on scores given by reviewers on major online review sites and OTAs. The GRI is calculated by analyzing quantitative scores on these sites using a proprietary algorithm.

Hotel room size and property type data (limited-service hotel vs. full-service hotel) come from SNL financial database. In the SNL financial database, the SNL Real Estate section combines real-time news, in-depth data, and expert real estate research on companies around the world. Access is offered to detailed news, pricing, and financial and property data through SNL's robust Web-and Excel-based platforms. Tables 3.11, 3.12, 3.13, 3.14, and 3.15 demonstrate the descriptive summary of the data.

The monthly REIT return, S&P 500 return, risk-free rate, SMB return and HML return are from the Center for Research in Security Prices (CRSP) database. The CRSP database was founded by Chicago Booth in 1960 and is a leading financial database providing financial information including U.S. stocks, U.S. Index History Files, U.S. Treasury, Bias-Free U.S. Mutual Funds, etc. The previously discussed financial data is used in the Fama-French three-factor model.

Quarterly financial information for REITs (such as total asset and net income) is from Bloomberg. Bloomberg is a premier site for business and financial market news. It

delivers world economic news, stock futures, stock quotes, and personal finance advice. The quarterly financial information for REITs is used in the Fama-French five-factor model to calculate profitability and investment factors.

Table 3.11 shows the descriptive statistics of variables. Table 3.12 shows the number of hotels owned by each individual REIT, average size and average rate of hotels, and weight of REIT by market capitalization. The number of hotels owned by each individual REIT ranges from seven to 91. The average room size ranges from 121 to 1,949. The average rate ranges from $74 to $390. Host Hotels & Resorts has the highest weight by market cap (39.6%). The next is LaSalle Hotel Properties.

Table 3.11: Descriptive Statistics of Variables

	Mean	Standard Error	Max	Min
Monthly Statistics				
REIT return-risk free	0.0097	0.09841	0.45757	-0.3536
S&P-risk free	0.01002	0.03591	0.10772	-0.0718
Small-Minus-Big Return	0.00089	0.01714	0.0358	-0.0368
High-Minus-Low Return	-0.0005	0.01472	0.0417	-0.0246
Review Return	0.00053	0.01527	0.08952	-0.0577
Quarterly Statistics				
REIT return-risk free	0.03544	0.18581	0.56582	-0.6891
S&P-risk free	0.03001	0.07449	0.1155	-0.1501
Small-Minus-Big Return	0.00044	0.03175	0.0498	-0.0838
High-Minus-Low Return	-0.0006	0.03074	0.0635	-0.0488
Profitability Factor	0.00327	0.03762	0.0803	-0.4706
Investment Factor	0.0264	0.08616	0.72749	-0.2624
Review Return	0.00158	0.02174	0.08196	-0.0849

Table 3.12: Descriptive Summary of Number of Hotel Owned, Average Size, Average Rate and Weight (by Market Capitalization)

REIT	Number of Hotel Owned	Average Size	Average Rate	Weight (by Market Cap)
Ashford Hospitality Trust	80	250	$210	0.0235
Chatham Lodging Trust	25	158	$206	0.0139
Chesapeake Lodging Trust	18	314	$261	0.0329
DiamondRock Hospitality Company	27	424	$284	0.0589
FelCor Lodging Trust Incorporated	48	299	$216	0.0284
Hersha Hospitality Trust	41	168	$240	0.0293
Host Hotels & Resorts	91	591	$307	0.396
LaSalle Hotel Properties	42	254	$296	0.0842
Pebblebrook Hotel Trust	25	249	$289	0.0554
RLJ Lodging Trust	69	196	$195	0.0807
Ryman Hospitality Properties	4	1949	$273	0.059
SoTHERLY Hotels Inc	10	245	$173	0.0018
Strategic Hotels & Resorts	16	517	$390	0.0523
Summit Hotel Properties	33	137	$172	0.0204
Sunstone Hotel Investors	27	495	$242	0.0631
Supertel Hospitality	7	121	$74	0.0001
Grand Total/Average	563	398	239	1

Table 3.13 summarizes the property type breakdown. Of 563 hotels, 384 are full-service hotels; 123 are limited-service hotel; 49 are extended hotels; seven are budget hotels. Table 3.14 summarizes the hotel score rating. Most of the hotels (89.2%) are 3- or 4- star hotels. Of 536 hotels, only 34 are 5-star hotels

Table 3.13: Descriptive Summary of Property Type

Property Type	Number of Hotels	Percentage
Full Service Hotel	384	68.2%
Limited Service Hotel	123	21.8%
Extended Stay Hotel	49	8.7%
Budget Hotel	7	1.2%
Grand Total	563	100.0%

Table 3.14: Descriptive Summary of Hotel Score Rating

Hotel Score Rating	Number of Hotels	Percentage
1.5	1	0.2%
2	5	0.9%
2.5	21	3.7%
3	169	30.0%
3.5	188	33.4%
4	145	25.8%
4.5	17	3.0%
5	17	3.0%
Grand Total	563	100.0%

Table 3.15 offers a detailed overview of property types and star levels. The star level of full-service hotels ranges from 2 to 5. Forty-six percent of full service hotels are 3.5-star and 38% of those are 4-star. The star level of limited service hotels ranges from 2.5 to 4. Seventy-six percent of full service hotels are 3-star and 14% of those are 2.5-star. Therefore, 3 stars is the dividing line between full-service hotels vs. limited-service hotels: 83% of full-service hotels are above 3 stars and 89% of limited-service hotels are at or below 3 stars.

Table 3.15: Descriptive Summary of Property Type and Star Rating Two-Way Table

	Star Level								
Property Type	1.5	2	2.5	3	3.5	4	4.5	5	Grand Total
Budget Hotel	1	3							4
Extended Stay Hotel		1		48					49
Full Service Hotel		1	4	26	175	144	17	17	384
Hotel				2	1				3
Limited Service Hotel			17	93	12	1			123
Grand Total	1	5	21	169	188	145	17	17	563

Table 3.16 shows the percentage of full-service hotels in each REIT. The percentage ranges from 16% to 100%. FelCor Lodging Trust Incorporated, LaSalle Hotel Properties, Pebblebrook Hotel Trust, Ryman Hospitality Properties, SoTHERLY Hotels Inc. and Strategic Hotels & Resorts own only full-service hotels.

Table 3.16: Descriptive Summary of Full Service Hotel Percentage

REIT	Full Service Hotel %
Ashford Hospitality Trust	68%
Chatham Lodging Trust	33%
Chesapeake Lodging Trust	82%
DiamondRock Hospitality Company	85%
FelCor Lodging Trust Incorporated	100%
Hersha Hospitality Trust	25%
Host Hotels & Resorts	99%
LaSalle Hotel Properties	100%
Pebblebrook Hotel Trust	100%
RLJ Lodging Trust	44%
Ryman Hospitality Properties	100%
SoTHERLY Hotels Inc	100%
Strategic Hotels & Resorts	100%
Summit Hotel Properties	16%
Sunstone Hotel Investors	93%
Supertel Hospitality	29%

3.2 Methodology

Given that the data has cross-sectional and time-series characteristics, I use a panel regression approach. To validate the results, I also use time series regression as a reference. Panel regression allows differences among entities (in this paper, entities refers to hotels) and variation among time periods. Therefore, panel regression controls for variables that cannot be observed or measured, such as differences in individual hotels across REITs; it also controls for variables that change over time but not across entities. Time series regression allows differences among entities but assumes that time periods are independent of each other.

To aggregate the review return to portfolio level, I use three weighting methods to weight the individual hotels in the REIT portfolio: simple average method (See Equation (7)); weighting by room size method (See Equation (8)); and weighting by the RevPAR method (See Equation (9)).

Assuming REIT i has N hotels: Hotel 1, Hotel 2 …… Hotel N. The room size of Hotel 1 is $size_1$, the room size of Hotel 2 is $size_2$ and the room size of Hotel N is $size_N$. The RevPar of hotel 1 is $RevPar_1$, the RevPar of hotel 2 is $RevPAR_2$ and the room size of hotel N is $RevPAR_N$.

Equation (7)

$$Review\ return\ of REIT_i = \frac{Review\ return\ of\ hotel\ 1 + \cdots review\ return\ of\ hotel\ N}{N}$$

Equation (8):

$$Review\ return\ of REIT_i = \frac{Review\ return\ of\ hotel\ 1 * \ size\ 1 + \cdots review\ return\ of\ hotel\ N * \ size\ N}{(size\ 1 + size2 + \cdots size\ N)}$$

Equation (9)

$$Review\ return\ of REIT_i = \frac{Review\ return\ of\ hotel\ 1 * RevPar\ 1 + \cdots review\ return\ of\ hotel\ N * RevPar\ N}{(RevPar\ 1 + RevPar\ 2 + \cdots RevPar\ N)}$$

Adding the review return into the single-factor model, three-factor model, and five-factor model, I have equation (10), (11), and (12). To examine the moderating role of property type and star rating, I replace the review return with review return*average star level and review return*property index. The property index (PI) is the percentage of limited service hotels owned by REITs. I have equations (13), (14), (15), and (16).

Equation (10): Single factor model with review return

$$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t) + v_i Rev_{it} + e_{it}$$

Equation (11): Three-factor model with review return

$$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t) + \ s_i SMB_t + h_i HML_t + v_i Rev_{it} + e_{it}$$

Equation (12): Five-factor model with review return

$$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t) + \ s_i SMB_t + h_i HML_t + r_i RMW_t + c_i CMA_t + v_i Rev_{it} + e_{it}$$

Equation (13): Three-factor model with review return*average star level

$$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t) + s_i SMB_t + h_i HML_t + v_i Rev_{it} * SL_i + e_{it}$$

Equation (14): Five-factor model with review return*average star level

$$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t) + s_i SMB_t + h_i HML_t + r_i RMW_t +$$

$$c_i CMA_t + v_i Rev_{it} * SL_i + e_{it}$$

Equation (15): Three-factor model with review return*property index

$$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t) + s_i SMB_t + h_i HML_t + v_i Rev_{it} * PI_i + e_{it}$$

Equation (16): Five-factor model with review return*property index

$$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t) + s_i SMB_t + h_i HML_t + r_i RMW_t + c_i CMA_t +$$

$$v_i Rev_{it} * PI_i + e_{it}$$

I scale star level in two ways as shown in Table 3.21. First, I scale the star level evenly in a linear relationship. Second, I scale the star in a non-linear way (Adjusted star level=2*0.5^star level, or Adjusted star level= 1/(star level)^2. If the coefficient of review return * star level is positive, it means that as the star level decreases, the impact of review return upon REIT return increases.

Table 3.21: Star Scale Table

	Before Scale	After Scale (Method 1: Linear)	After Scale (Nonlinear)	
			Method 2: Adjusted star level=2*0.5^star level	Method 3: Adjusted star level= 1/(star level)^2
Star 1	1	1	1	1
Star 1.5	1.5	0.875	0.707106781	0.444444444
Star 2	2	0.75	0.5	0.25
Star 2.5	2.5	0.625	0.353553391	0.16
Star 3	3	0.5	0.25	0.111111111
Star 3.5	3.5	0.375	0.176776695	0.081632653
Star 4	4	0.25	0.125	0.0625
Star 4.5	4.5	0.125	0.088388348	0.049382716

Star 5	5	0	0.0625	0.04

Chapter 4: Empirical Results

The empirical results consist of three parts. In the first part (4.1), I apply the one factor CAPM model and the three- and five-factor Fama-French models and show that three- and five-factor models outperforms the single factor CAPM model in explaining most of the variance of the REIT returns. Consistent with previous findings, the market return is strongly correlated with REIT returns. Alpha (the intercept) estimates of hotel REITs were not significantly higher or lower than zero. This suggests that hotel REITs neither outperform nor underperform the overall stock market on a risk-adjusted basis. In the second part (4.2, 4.3, and 4.4), I add review return into the asset pricing model and find that review return has no significant impact on REIT return. I further examine the moderating role of star level and property index (percentage of limited-service hotels) in explaining the relationship between REIT return and review return. In the third part, I examine the impact of lagged review return upon REIT return and find no significant relationship between the two (4.5).

As mentioned in Section 3.2, I use three methods to weight the review return: method 1, simple average; method 2, weighted by room size and method 3, weighted by RevPAR. In this section, the results are based on weighting by RevPAR because in the sample of 563 hotels, the room size, room rate, and occupancy vary significantly. (Average room size ranges from 121 to 1,949; average rate ranges from $74 to $390; average occupancy ranges from 60% to 89.5%). Under weighting method 1 and weighting method 2, the review return, review return * star level and review return* PI are insignificant. The level of significance

of other variables (except intercept) under weighting method 2 and weighting method 3 are the same as those under weighting method 1.

4.1 CAPM vs. Fama and French Three-Factor and Five-Factor Models

Table 4.11 shows the panel regression results and Table 4.12 shows the time series regression results. In the panel regression output, the adjusted R square increases from 21.4% (one-factor CAPM model) to 58.1% (FF five-factor model). Similarly, in the time series regression output, the adjusted R square increases from 25.8% to 59.8%. This is consistent with previous studies suggesting that the single-factor asset pricing model may not be appropriate for understanding the risk, return, and performance of real estate assets.

Market return is positive in both panel regression and time series regression, which is consistent with previous research findings that high market beta is observed regardless of the market proxy (such as the S&P 500 or REIT index). This suggests that the hotel REIT market is integrated (at least partially) with the stock market due to the highly cyclical and volatile nature of the hotel industry..

The coefficient of market return is 1.219 in the CAPM single-factor model and 0.908 in the Fama-French three-factor model and 1.712 in the Fama-French five-factor model. Jackson (2008) used the Jensen index method and the S&P 500 as the market proxy to examine the hotel REIT risk-return characteristics from 1993 to 2005. In the single-factor regression results, the coefficient of market return is 0.5414. Kim et al. (2002) used the same approach (Jensen Index) to examine the hotel REIT risk-return relationship from 1993 to 1999. In its single-factor regression output, the coefficient of beta is 1.1091. Kim and Jang (2011) used CAPM and the Fama-French three-factor model to examine the risk-return relationship of hotel REITs from 2000 to 2009. In its regression model, the

coefficient of market is 1.4194 in the single-factor model and 0.9763 in the Fama-French three-factor model. Using different approaches and testing the data in different periods produces different coefficients of market return in the regression model. Therefore, the focus here is not to argue whether the coefficient should be 0.5414 or 1.1091 or 1.4194 and why the coefficients in the single-factor model and three-factor model are different. The purpose of the regression model is to test which factor has a significant impact on hotel REIT return, rather than quantifying the impact because it is meaningless to say a 1% increase in the S&P 500 returns leads to a 0.5414% increase in hotel REIT returns.

Size factor is insignificant in panel regression and significant in time series regression. Book-to-market ratio, profitability factor, and investment factor are all insignificant in both the panel regression and time series regression.

Table 4.11: One/Three/Five-Factor Model (Panel Regression)

	CAPM	Fama-French Three-Factor Model	Fama-French Five-Factor Model
Alpha	0.035 (0.014)	0.105 (0.128)	0.03 (0.143)
R_m-R_f	1.219** (0.361)	0.908** (0.39)	1.712* (0.732)
SMB		1.464 (0.861)	1.679 (0.65)
HML		0.779 (0.837)	0.384 (2.403)
RMW			0.29 (0.234)
CMA			-0.05 (0.096)
Adjusted R Square	0.214	0.292	0.581

Table 4.12: One/Three/Five-Factor Model (Time Series Regression)

	CAPM	Fama-French Three-Factor Model	Fama-French Five-Factor Model
Alpha	-0.007 (0.005)	-0.005 (0.0045)	-0.007 (0.01)
R_m-R_f	1.654** (0.1225)	1.307** (0.1423)	1.3886* (0.1795)
SMB		1.315 (0.2951)	1.3782 (0.424)
HML		0.0512 (0.2992)	0.5759 (0.3069)
RMW			0.1416 (0.2432)
CMA			0.007 (0.1064)
Adjusted R Square	0.258	0.297	0.598

4.2 CAPM vs. Fama and French Three-Factor and Five-Factor Models with Review Return

Table 4.21 shows the panel regression results and Table 4.22 shows the time series regression results. Comparing Table 4.21 and Table 4.11, the adjusted R Square of model with review return is higher than that of model without review return (0.223 vs. 0.214, 0.301 vs. 0.292, 0.665 vs. 0.581). This means that the return of online consumer review ratings helps explain more variation of the REIT return. Similarly, in the time series regression output, the adjusted R square increases from 25.8% to 26.36%, 29.7% to 40%, and 59.8% to 60.0%. Market return is positive and significant in both panel regression and time series regression. In the single factor model (panel regression), the intercept is significant. It is misleading in the sense that investors can earn abnormal returns by investing in the assets. Size factor is positive in time series regression but not in panel

regression. Book-to-market ratio, profitability factor, and investment factor are all insignificant in both the panel regression and time series regression.

Table 4.21: One/Three/Five-Factor Model with Review Return (Panel Regression)

	CAPM	Fama-French Three-Factor Model	Fama-French Five-Factor Model
Alpha	0.0349** (0.014)	0.015 (0.018)	0.037 (0.147)
R_m-R_f	1.22** (0.361)	0.941** (0.404)	1.692** (0.726)
Review Return	0.099 (0.148)	0.1 (0.147)	0.492 (0.403)
SMB		1.47 (0.865)	1.758 (2.705)
HML		0.77 (0.837)	0.325 (2.321)
RMW			0.259 (0.233)
CMA			-0.04 (0.103)
Adjusted R square	0.223	0.301	0.665

Table 4.22: One/Three/Five-Factor Model with Review Return (Time Series Regression)

	CAPM	Fama-French Three-Factor Model	Fama-French Five-Factor Model
Alpha	-0.007** (0.005)	-0.005 (0.003)	-0.006 (0.011)
R_m-R_f	1.6583** (0.1215)	1.346** (0.1138)	1.3856** (0.1898)
Review Return	0.1866 (0.2049)	0.2534 (0.2205)	0.3136 (0.4229)
SMB		1.2055	1.378**

		(0.236)	(0.4246)
HML		0.1142 (0.2311)	0.5717 (0.3074)
RMW			0.245 (0.245)
CMA			-0.002 (0.1072)
Adjusted R square	0.2636	0.4	0.6

4.3 Moderating Role of Property Type

Table 4.31 shows the panel regression results and Table 4.32 shows the time series regression results. Market return is positively related to the REIT return in both the panel regression and the time series regression. In the panel regression and the time series regression, review return* PI (limited-service hotel percentage) is positive in the three-factor model and insignificant in the five-factor model. In the panel regression, the size factor is insignificant in the three-factor model and positive in the five-factor model. In the time series regression, the size factor is significant in the five-factor model. Book-to-market ratio, profitability factor, and investment factor are all insignificant in both the panel regression and the time series regression.

Table 4.31: Three/Five-Factor Model with Review Return*PI (Panel Regression)

	Fama-French Three-Factor Model with Review Return * Property Index	Fama-French Five-Factor Model with Review Return * Property Index
Alpha	-0.005 (0.014)	-0.005 (0.014)
Rm-Rf	1.338** (0.442)	1.362** (0.192)
Review Return*PI	0.77* (0.381)	1.67 (0.913)
SMB	1.212	1.779**

	(1.33)	(0.468)
HML	0.104 (0.116)	0.492 (0.394)
RMW		0.252 (0.236)
CMA		0.01 (0.1)
Adjusted R square	0.42	0.54

Table 4.32: Three/Five-Factor Model with Review Return*PI (Time Series Regression)

	Fama-French Three-Factor Model with Review Return * Property Index	Fama-French Five-Factor Model with Review Return * Property Index
Alpha	-0.005 (0.014)	-0.006 (0.011)
Rm-Rf	1.305** (0.1425)	1.967** (0.1787)
Review Return*PI	0.859* (0.407)	1.512 (0.931)
SMB	1.3176** (0.2956)	1.3947** (0.4221)
HML	0.049 (0.2926)	0.5207 (0.3073)
RMW		0.135 (0.2421)
CMA		-0.006 (0.1062)
Adjusted R square	0.4383	0.6049

4.4 Moderating Role of Hotel Star Level

In this section, I examine the moderating role of the hotel star level in the relationship between the REIT return and the review return. Tables 4.41 and 4.42 show the three-factor and five-factor models with review return*star level under linear scale method 1.

The market return is strongly related to the REIT return in both the panel regression and the time series regression. In the panel regression, review return* star level has a positive impact on the REIT return. In the time series regression, the review return* star level has a positive impact in the five-factor model but not in the three-factor model. Size factor has a positive impact on the REIT return in the time series regression. Book-to-equity factor, profitability factor, and investment factor all have an insignificant impact on the REIT return.

Table 4.41: Three/Five-Factor Model with Review Return*Star Level under Linear Scale Method 1 (Panel Regression)

	Fama-French Three-Factor Model with Review Return * Average Star Level	Fama-French Five-Factor Model with Review Return * Average Star Level
Alpha	-0.005 (-0.013)	-0.005 (-0.167)
Rm-Rf	1.337** (-0.441)	1.3452** (-0.192)
Review Return*Star Level	0.786* (-0.384)	1.731* (-0.813)
SMB	1.214 (-0.913)	1.757 (-0.469)
HML	0.105 (-0.875)	0.53 (-0.393)
RMW		0.242 (-0.235)
CMA		-0.009 (-0.1)
Adjusted R square	0.419	0.538

Table 4.42: Three/Five-Factor Model with Review Return*Star Level under Linear Scale Method 1 (Time Series Regression)

	Fama-French Three-Factor Model with Review Return * Average Star Level	Fama-French Five-Factor Model with Review Return * Average Star Level
Alpha	-0.005 (0.005)	-0.006 (0.011)
Rm-Rf	1.3079** (0.1425)	1.3848** (0.1792)
Review Return* Star Level	0.8256* (0.407)	1.727* (0.8272)
SMB	1.312** (0.2956)	1.3937** (0.4234)
HML	0.0524 (0.2918)	0.5488 (0.307)
RMW		0.124 (0.2431)
CMA		-0.006 (0.1067)
Adjusted R square	0.4382	0.6027

Tables 4.43 and 4.44 show the three-factor and five-factor models with review return*star level under nonlinear scale method 2. The market return is strongly related to the REIT return in both the panel regression and the time series regression. In the panel regression, the review return * star level has a positive significant impact on the REIT return in the three-factor model. In the time series regression, the review* star level has a positive impact. Size factor has a positive impact on the REIT return in the time series regression. Book-to -equity factor, profitability factor, and investment factor all have an insignificant impact on the REIT return.

Table 4.43: Three/Five-Factor Model with Review Return*Star Level under Nonlinear Scale Method 2 (Panel Regression)

	Fama-French Three-Factor Model with Review Return * Average Star Level	Fama-French Five-Factor Model with Review Return * Average Star Level
Alpha	-0.005 (0.014)	-0.006 (0.011)
Rm-Rf	1.337** (0.441)	1.3865** (0.1789)
Review Return* Star Level	1.257* (0.645)	1.959 (1.314)
SMB	1.216 (0.915)	1.3978** (0.4227)
HML	0.104 (0.899)	0.5378 (0.3069)
RMW		0.1281 (0.2425)
CMA		-0.006 (0.1064)
Adjusted R square	0.419	0.6039

Table 4.44: Three/Five-Factor Model with Review Return*Star Level under Nonlinear Scale Method 2 (Time Series Regression)

	Fama-French Three-Factor Model with Review Return * Average Star Level	Fama-French Five-Factor Model with Review Return * Average Star Level
Alpha	-0.005 (0.004)	-0.006 (0.0164)
Rm-Rf	1.336** (0.1137)	1.3481** (0.192)
Review Return* Star Level	1.667* (0.743)	2.488* (1.276)
SMB	1.2244** (0.2358)	1.3481** (0.468)
HML	0.1102 (0.2314)	0.515 (1.31)
RMW		0.246

		(0.235)
CMA		-0.009 (0.09)
Adjusted R square	0.399	0.539

Tables 4.45 and 4.46 show the three-factor and five-factor models with review return*star levels under nonlinear scale method 3. The market return is strongly related to the REIT return in both the panel regression and the time series regression. Review return * Star level has a positive impact on the REIT return in both the panel regression and the time series regression. Size factor has a positive impact on REIT return in the time series regression. Book-to-market ratio, profitability factor, and investment factor all have an insignificant impact on the REIT return.

Table 4.45: Three/Five-Factor Model with Review Return*Star Level under Nonlinear Scale Method 3 (Panel Regression)

	Fama-French Three-Factor Model with Review Return * Average Star Level	Fama-French Five-Factor Model with Review Return * Average Star Level
Alpha	-0.00475 (0.0137)	-0.00553 (0.0164)
Rm-Rf	1.336** (0.4415)	1.3490** (0.1919)
Review Return* Star Level	2.60* (1.2919)	4.87* (2.4987)
SMB	1.216724 (0.9149)	1.772033 (0.4678)
HML	0.103609 (0.8989)	0.510393 (0.3923)
RMW		0.247452 (0.2348)
CMA		-0.009 (0.09)
Adjusted R square	0.419	0.54

Table 4.46: Three/Five-Factor Model with Review Return*Star Level under Nonlinear Scale Method 3 (Time Series Regression)

	Fama-French Three-Factor Model with Review Return * Average Star Level	Fama-French Five-Factor Model with Review Return * Average Star Level
Alpha	-0.0048 (0.004)	-0.006 (0.011)
Rm-Rf	1.335** (0.1137)	1.3871** (0.1788)
Review Return*PI	2.4494* (1.2141)	3.993 (2.5728)
SMB	1.2251** (0.2359)	1.988** (0.4225)
HML	0.1097 (0.2314)	0.5345 (0.3068)
RMW		0.1292 (0.2323)
CMA		-0.006 (0.1063)
Adjusted R square	0.3989	0.6044

4.5 Impact of Lagged Review Return (*Star Level) on REIT Return

In this session, I examine the impact of lagged review return/review return * star level on the REIT return. I use one-month, two-month, and one-quarter lag returns as shown in Equation (17), (18), (19), (20), (21) and (22). For the one-month lag: January's review return and February's Fama-French factors. For the two-month lag: January's review return and March's Fama-French factors. For the three-month lag: January's review return and April's Fama-French factors.

Equation (17)

$$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t) + s_i SMB_t + h_i HML_t + v_i Rev_{it-1} + e_{it}$$

Equation (18)

$$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t) + \ s_i SMB_t + h_i HML_t + v_i Rev_{it-2} + e_{it}$$

Equation (19)

$$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t) + \ s_i SMB_t + h_i HML_t + v_i Rev_{it-3} + e_{it}$$

Equation (20)

$$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t) + \ s_i SMB_t + h_i HML_t + v_i Rev_{it-1} * SL_i + e_{it}$$

Equation (21)

$$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t) + \ s_i SMB_t + h_i HML_t + v_i Rev_{it-2} * SL_i + e_{it}$$

Equation (22)

$$R_{it} - Rf_t = a_i + b_i\ (Rm_t - Rf_t) + \ s_i SMB_t + h_i HML_t + v_i Rev_{it-3} * SL_i + e_{it}$$

I first show the bivariate correlations of REIT excess return vs. lagged review return. There is no significant correlation between REIT excess return and lagged review return.

1. One month lag: 0.00287

2. Two month lag: 0.03729

3. Three month lag: 0.0291

Table 4.51 and Table 4.52 show the lagged review return regression model (panel regression and time series regression). The lagged review return has no significant impact on REIT return.

Table 4.51: Lagged Review Return (Panel Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	-0.002 (0.0137)	-0.002 (0.0127)	0.0021 (0.0098)
Rm-Rf	1.239** (0.536)	1.218** (0.518)	1.211** (0.217)
Lagged Review Return	0.427	0.443	0.062

	(0.204)	(0.225)	(0.224)
SMB	1.540** (0.247)	1.560** (0.251)	1.190** (0.2)
HML	0.023 (0.226)	0.069 (0.828)	0.008 (0.0276)
Adjusted R Square	0.412	0.414	0.416

Table 4.52: Lagged Review Return (Time Series Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	-0.002 (0.004)	-0.002 (0.004)	-0.002 (0.003)
Rm-Rf	1.2469** (0.1157)	1.2283** (0.1181)	1.2211** (0.1176)
Lagged Review Return	0.222 (0.2202)	0.246 (0.2238)	0.0389 (0.2238)
SMB	1.5286** (0.2471)	1.5478** (0.2513)	1.5748** (0.25)
HML	0.0253 (0.2301)	0.0681 (0.2421)	0.1119 (0.2505)
Adjusted R Square	0.416	0.419	0.426

I then show the bivariate correlations between REIT excess return and lagged review return* star level. There is no significant correlation between REIT excess return and lagged review return* star rating under either the linear scale or the nonlinear scale.

Method 1: Linear Scale

1. One month lag: 0.0231

2. Two month lag: 0.059

3. Three month lag: 0.0231

Method 2: Nonlinear Scale

1. One month lag: 0.0197

2. Two month lag: 0.054

3. Three month lag: 0.0241

Method 3: Nonlinear Scale

1. One month lag: 0.0169

2. Two month lag: 0.061

3. Three month lag: 0.0181

Table 4.53 and Table 4.54 show the lagged review return* star level under scale method 1. Table 4.55 and Table 4.56 show the lagged review return* star level under scale method 2. Table 4.57 and Table 4.58 show the lagged review return* star level under scale method 3. The lagged review return* star level has no significant impact on REIT return.

Table 4.53: Lagged Review Return* Star Level under Linear Scale Method 1(Panel Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	-0.00159 (0.0141)	-0.00179 (0.0143)	-0.0024 (0.00863)
Rm-Rf	1.242** (0.4557)	1.23** (0.4686)	1.222** (0.2767)
Lagged Review Return*Star Level	0.427 (0.3869)	0.59311 (0.3919)	0.08098 (0.5094)
SMB	1.528682** (0.9773)	1.550519** (0.9968)	1.57446** (0.251)
HML	0.016127 (0.9083)	0.067898 (0.9608)	0.5886 (0.5893)
Adjusted R Square	0.412	0.416	0.416

Table 4.54: Lagged Review Return* Star Level under Linear Scale Method 1(Time Series Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	-0.0017 (0.0036)	-0.0018 (0.0035)	-0.0024 (0.0004)
Rm-Rf	1.2423**	1.2301**	1.2214**

	(0.1152)	(0.1177)	(0.1176)
Lagged Review Return*Star Level	0.4266 (0.4408)	0.8011 (0.4476)	0.0287 (0.5777)
SMB	1.5301** (0.2471)	1.5444** (0.2504)	1.5748** (0.25)
HML	0.0209 (0.2301)	0.0684 (0.2415)	0.1132 (0.2504)
Adjusted R Square	0.416	0.421	0.423

Table 4.55: Lagged Review Return* Star Level under Nonlinear Scale Method 2 (Panel Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	-0.00158 (0.0141)	-0.00175 (0.0143)	-0.0024 (0.00863)
Rm-Rf	1.242** (0.4557)	1.226** (0.4684)	1.222** (0.2767)
Lagged Review Return*Star Level	0.70501 (0.6491)	1.12226 (0.6574)	0.16604 (1.0399)
SMB	1.5280** (0.9772)	1.5525** (0.9964)	1.5744** (0.5886)
HML	0.014819 (0.9082)	0.066782 (0.9604)	0.11433 (0.5893)
Adjusted R Square	0.412	0.416	0.416

Table 4.56: Lagged Review Return* Star Level under Nonlinear Scale Method 2 (Time Series Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	-0.0016 (0.0036)	-0.0017 (0.0039)	-0.0027 (0.0037)
Rm-Rf	1.2408** (0.1153)	1.2289** (0.1175)	1.2358** (0.1183)
Lagged Review Return*Star Level	0.6226 (0.7398)	1.4919 (0.7505)	0.0243 (1.812)
SMB	1.513** (0.2472)	1.5475** (0.2501)	1.5577** (0.2505)
HML	0.02	0.0671	0.1083

	(0.2302)	(0.2413)	(0.2504)
Adjusted R Square	0.416	0.422	0.427

Table 4.57: Lagged Review Return* Star Level under Nonlinear Scale Method 3 (Panel Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	-0.00158 (0.0141)	-0.00174 (0.0143)	-0.0024 (0.00862)
Rm-Rf	1.242** (0.4557)	1.226** (0.4683)	1.222** (0.2767)
Lagged Review Return*Star Level	1.44157 (1.3002)	2.2786 (1.317)	0.30224 (2.2614)
SMB	1.5274** (0.9772)	1.5538** (0.9962)	1.5745** (0.5886)
HML	0.014244 (0.9082)	0.066475 (0.9602)	0.11424 (0.5893)
Adjusted R Square	0.412	0.416	0.416

Table 4.58: Lagged Review Return* Star Level under Nonlinear Scale Method 3 (Time Series Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	-0.0016 (0.0036)	-0.0017 (0.0036)	-0.0023 (0.0037)
Rm-Rf	1.2405** (0.1153)	1.2281** (0.1175)	1.2213** (0.1176)
Lagged Review Return*Star Level	1.2003 (1.4828)	2.0451 (1.5036)	0.1682 (2.5636)
SMB	1.5315** (0.2472)	1.5491** (0.25)	1.5748** (0.25)
HML	0.0197 (0.2302)	0.0667 (0.2413)	0.1131 (0.2504)
Adjusted R Square	0.4155	0.4224	0.4256

4.6 Model Comparison

4.61 Weighting Method Comparison

I used three methods to weight review return: method 1, a simple average; method 2, weighted by room size; method 3, weighted by RevPAR. The results reported in the empirical results section are based on weighting method 3 (weighted by RevPAR). The results based on weighting method 2 and weighting method 3 are summarized in the appendix. Under weighting method 2 and weighting method 3, the review return, or review return * star level, review return* PI are insignificant. The coefficient and level of significance of other variables (except review return) under weighting method 2 and weighting method 3 are the same as those under weighting method 1.

4.62 Model Comparison (One-, Three-, and Five-Factor Models)

It is obvious that the one-factor CAPM model underperforms the Fama-French three- or five-factor models as it only explains 20% of the variation in REIT return. The FF five-factor model outperforms the three-factor model in terms of explaining more variation in REIT return (Adjusted R^2: 60% vs. 40%).

The coefficients differ slightly in the three-factor and five-factor models. Two reasons are investigated. First, I consider whether there is multicollinearity in the independent variables. If there is, the model will be biased. As shown in Table 4.621, the independent variables are not highly correlated.

Table 4.621: Correlation between Independent Variables

	REIT-risk free	S&P-risk free	SMB	HML	PROF	INV
REIT-risk free	1					

S&P-risk free	0.7473	1				
SMB	0.6659	0.4301	1			
HML	0.283	0.2251	0.2662	1		
PROF	-0.028	-0.0853	-0.0366	-0.0039	1	
INV	-0.0874	-0.1086	-0.1037	-0.0397	-0.0699	1

The second possible reason that could potentially explain the slight difference in coefficients is that I use monthly data for the three-factor model and quarterly data for the five-factor model because the investment factor and profitability factor are calculated using total asset and net income, which are only available in the disclosed quarterly financial report and annual financial report. I sum the monthly REIT, S&P 500 return, SMB, and HML to get the quarterly return, which causes a slight difference in coefficient.

It is hard to conclude which model is better (the three-factor model or the five-factor model) based on what I have here. As the five-factor model uses quarterly data, there are only 3*4 = 12 data points for each REIT. It is possible that the five-factor model is good but as I only have 12 data points for each REIT the result may be biased. In addition, the five-factor model was proposed in 2013 by Fama and French and is still in the beta stage.

4.63 Model Comparison (Panel Random Effect Regression vs. Time Series Regression)

There is no significant difference in results between the panel regression and the time series regression except for the size factor. The size factor is insignificant in the panel regression but significant in the time series regression. As shown in Table 4.631, Host Hotels & Resorts has the largest capitalization but it does not have the highest average

return. Therefore, panel random effect regression is more efficient in modeling the relationship between REIT return and independent variables.

Table 4.631 REIT return and Market Capitalization

REIT	Average Return	Weight (by Market Cap)
Ashford Hospitality Trust	1.50%	2.35%
Chatham Lodging Trust	1.51%	1.39%
Chesapeake Lodging Trust	1.45%	3.29%
DiamondRock Hospitality Company	1.39%	5.89%
FelCor Lodging Trust Incorporated	0.57%	2.84%
Hersha Hospitality Trust	0.92%	2.93%
Host Hotels & Resorts	0.51%	39.60%
LaSalle Hotel Properties	0.42%	8.42%
Pebblebrook Hotel Trust	0.57%	5.54%
RLJ Lodging Trust	0.88%	8.07%
Ryman Hospitality Properties	1.47%	5.90%
SoTHERLY Hotels Inc	1.67%	0.18%
Strategic Hotels & Resorts	1.49%	5.23%
Summit Hotel Properties	1.06%	2.04%
Sunstone Hotel Investors	2.78%	6.31%
Supertel Hospitality	-2.58%	0.01%

4.7 Trading on Review Return

In this section, I develop a trading strategy based on review return. First, I sort the 16 REITs at month t based on the review return and select the two REITs with the highest review return as “winners” and two REITs with the lowest review return as “losers”. I then short the losers and get $1 proceed ($0.50 from loser 1 and $0.50 from loser 2). Based on the price of losers, I calculate the number of shares to short. I then use the proceeds from this short position to long winners. I use $0.50 to purchase long winner 1 and $0.50 to purchase long winner 2. Based on the price of the winners, I calculate the number of shares I long. I then calculate the dollar return per share for winners and losers in the next one,

three, and six months as shown in Table 4.71, 4.72 and 4.73. Multiplying dollar return per share by the number of shares, I get the total dollar profit on four REITs. According to Table 4.71, 4.72 and 4.73, the total dollar profit increases as the number of holding months increases.

Table 4.71: Trading Strategy Result Summary (1-month holding)

Time	Winner 1	Winner 2	Loser 1	Loser 2
20110331	0.03437	0.03280	-0.03714	0.02296
20110430	-0.06536	-0.11911	0.05696	0.02298
20110531	0.07793	-0.00790	0.03127	0.02464
20110630	-0.07253	0.02726	-0.02569	0.03637
20110731	-0.07109	-0.11162	0.13410	0.15403
20110831	-0.05111	0.14141	-0.15617	-0.18325
20110930	0.01307	0.23206	-0.28604	-0.20873
20111031	0.03214	-0.07008	-0.05351	0.12494
20111130	0.03054	0.16360	0.01222	-0.00872
20111231	-0.00623	0.03286	0.05825	-0.40098
20120131	-0.06624	-0.06786	-0.01717	0.08376
20120229	0.02460	0.09236	0.00164	-0.02642
20120331	0.00317	-0.01192	-0.01886	0.00623
20120430	0.08972	-0.06170	0.07263	0.13727
20120531	0.03607	0.11347	-0.04435	-0.06674
20120630	-0.04809	-0.06895	0.03100	0.04769
20120731	-0.02111	0.05698	-0.07202	0.04093
20120831	0.03242	0.01268	0.00884	-0.03516
20120930	0.00600	-0.07419	0.06380	0.04407
20121031	0.08144	0.09753	-0.02032	-0.12113
20121130	0.05849	-0.00321	-0.06369	-0.01510
20121231	-0.01494	0.00650	0.05114	-0.07348
20130131	-0.07381	-0.44246	-0.14610	0.04675
20130228	0.07586	0.06532	-0.13509	-0.03601
20130331	0.04567	-0.02985	0.06253	-0.01621
20130430	0.00765	-0.05726	0.09140	-0.01249
20130531	-0.03678	-0.03432	-0.05305	-0.01894
20130630	0.02438	-0.04628	0.03767	0.04690
20130731	0.00508	-0.06605	0.03555	0.05367
Total Dollar Return				-0.75702

Table 4.72: Trading Strategy Result Summary (3-month holding)

Time	Winner 1	Winner 2	Loser 1	Loser 2
20110331	-0.03472	0.03326	0.01668	0.03982
20110430	-0.02722	0.17500	0.05817	0.04447
20110531	0.03267	-0.10766	0.15139	0.12200
20110630	-0.21107	0.01679	0.08649	-0.02192
20110731	0.07758	0.08528	-0.18725	-0.16974
20110831	0.02935	-0.05507	-0.11844	-0.15126
20110930	0.00019	0.14123	-0.25523	-0.09853
20111031	0.08379	-0.05502	-0.23788	0.01960
20111130	0.00368	0.07673	0.05919	-0.03679
20111231	-0.02981	0.00701	0.13295	-0.08468
20120131	-0.05249	-0.02758	-0.09999	0.02678
20120229	-0.07918	0.00038	0.01835	0.04406
20120331	0.03346	-0.03174	-0.03607	0.00908
20120430	-0.03375	-0.05046	0.04300	0.06317
20120531	0.06661	0.05285	-0.03941	-0.05017
20120630	-0.00819	-0.05812	0.02018	0.02493
20120731	-0.01091	-0.01867	0.00692	0.08619
20120831	-0.05252	-0.03591	0.04404	-0.11025
20120930	0.09363	-0.00801	-0.01461	-0.05970
20121031	0.10137	0.19687	-0.02660	-0.12518
20121130	0.00365	-0.03121	-0.04514	-0.00359
20121231	-0.02566	-0.02539	0.05364	0.04275
20130131	-0.06492	-0.03247	-0.00480	0.03342
20130228	0.00020	0.00323	-0.05198	0.01398
20130331	0.04170	-0.00039	0.06107	-0.00956
20130430	-0.04241	-0.00870	0.05015	-0.00846
20130531	-0.01635	-0.05718	0.04065	-0.02419
20130630	0.03517	-0.01438	-0.01302	0.01984
20130731	-0.01086	-0.01456	-0.06001	-0.03371
20130831	-0.09247	0.13946	-0.02275	-0.01213
Total Dollar Return				-0.67400

Table 4.73: Trading Strategy Result Summary (6-month holding)

Time	Winner 1	Winner 2	Loser 1	Loser 2
20110331	0.22140	-0.01602	-0.00805	0.01764
20110430	-0.08576	-0.09411	0.14872	0.13937
20110531	0.25542	0.00790	-0.06382	0.00764
20110630	-0.20646	0.08673	-0.11148	-0.04365
20110731	0.06309	0.03465	-0.10198	-0.14766
20110831	0.11909	0.21362	-0.17897	-0.15605
20110930	0.04283	0.08567	-0.17262	-0.06996
20111031	0.09415	-0.09315	0.01787	0.07744

20111130	-0.02109	0.06271	0.05244	-0.05034
20111231	-0.03654	0.01323	0.03162	-0.12381
20120131	-0.09439	-0.07586	-0.02419	0.08637
20120229	-0.03470	0.05311	-0.03024	-0.00169
20120331	0.07809	0.02258	0.02615	0.02889
20120430	-0.01727	-0.06152	0.07464	0.13847
20120531	0.02592	-0.00522	-0.04673	-0.12024
20120630	0.00619	0.03721	-0.06968	0.00468
20120731	0.18167	0.01877	-0.09305	0.03858
20120831	0.15192	-0.03258	0.04072	-0.30085
20120930	0.02995	0.01508	-0.02056	-0.04548
20121031	0.06118	0.33968	0.00760	-0.02901
20121130	-0.02397	-0.03480	0.08102	0.07989
20121231	-0.01659	-0.05568	0.05399	0.00461
20130131	-0.10856	-0.04060	-0.02260	0.00421
20130228	-0.04047	0.00036	0.01115	-0.00954
20130331	0.02021	0.01263	0.05836	-0.04540
20130430	0.01722	0.05032	0.05992	-0.04274
20130531	-0.00462	0.02874	-0.01511	-0.02655
Total Dollar Return				0.37129

Chapter 5: Conclusions and Limitations

The finding of this paper has two parts. In the first part, I use the CAPM one-factor model and Fama-French three- and five-factor models and find that hotel REIT return is strongly related to market return due to the highly cyclical and volatile nature of the hotel industry. This is consistent with previous research findings that high market beta is observed regardless of the market proxy (such as the S&P 500 or REIT index). Regression intercept is significant in the single-factor model, meaning that investors can earn abnormal returns by investing in the assets. This is inconsistent with previous findings that hotel REITs neither underperform nor outperform the market overall.

Size factor is positive in the time series regression but insignificant in the panel regression. In previous studies, Jackson (2008) and Kim and Jang (2011) showed a positive and significant market factor. To investigate whether size factor is significant, I calculate the average REIT return of each REIT and do not find a high correlation between market capitalization and REIT return. Book-to-market ratio, profitability factor, and investment factor are not insignificant. This is different from previous findings. Peterson and Hsieh (1997) found that equity REIT risk premiums are significantly related to the market, size, and BE/ME factors. Cooper et al. (2008) documented a negative relation between current investment and future returns. Cohen et al. (2002) found that average returns are positively related to profitability.

In the second part, I add the review return into the one-, three-, and five-factor models and find that review return has an insignificant impact on REIT return under three weighting methods. I further create an interaction term of review return and star level/ property type index. I use three methods (both linear and nonlinear) to scale a hotel's star level from 1 to 0. The property type index is the percentage of limited-service hotels. The interaction term is significant, meaning that when moderated by star level and property type, review return has an impact on REIT return. Online consumer review ratings have greater influence on limited-service hotels than on full-service hotels; online consumer review ratings have greater influence on low-star level service hotels than on high-star level hotels.

Finally, I investigate whether review return can predict REIT return. I lag the review return by one month, two months, and three months and regress the lagged review return on REIT return with all other variables being equal. I also regress the lagged review return

* star level on REIT return. I find no significant relationship between review return (* star level) and REIT return. I then develop a trading strategy by selecting "winners" and "losers" based on review return and calculate the dollar return in the next one, three, and six months. There is insufficient evidence to support a claim that investors can make profits by developing strategies based on review returns.

This paper contributes to a growing body of literature about online reviews and asset pricing in the hotel REIT sector. I demonstrate that online consumer review ratings have a positive impact on REIT returns when moderated by star level and property type. The lower the star level, the higher is the impact of review return on REIT return. The influence of review return has greater influence on limited-service hotels than on full-service hotels. These results have important implication for REIT investors. When investing in low-star and limited-service hotels, investors should pay more attention to online consumer review ratings on third party sites to see whether the online consumer review ratings are in an increasing or decreasing trend. When managing an investment portfolio, investors should monitor the online consumer review ratings of each individual hotel and consider online consumer review rating as a factor in making hold and sell decisions.

The major limitation of this paper is its short scale of period. This paper only uses three years of data. A typical asset-pricing model uses 20 years of data or at least 10-year data in order to cover at least one market cycle (up market and down market). This paper also has selection biases as it only includes the 16 publicly traded hotel REITs in the U.S. and does not include private REITs. Therefore, the paper's conclusions may be of use only to investors of publicly traded hotel REITs. In addition, this paper divides the hotels by star level and property type. Further work may divide the hotels by chain hotels vs. independent

hotels. In its asset pricing model, this paper uses investment factor and profitability as proposed by Fama and French in their recent asset pricing paper. There is still work to be done on the measurement of investment factor and profitability factor on assets (stocks, bonds and REITs). In addition, this paper does not include behavioral finance factors that may explain the variation in hotel REITs, such as momentum and herding factors. Nonetheless, these results can be generalized to the extent that factors not considered in the model are random across this sample. Although the results of this paper are limited, this paper is a good start in investigating the impact of online consumer review ratings on hotel REIT performance and has important implications for investors and portfolio managers.

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Appendix

Table A1: One/Three/Five Factor Model (Simple Average Weighting, Panel Regression)

	CAPM with Review Return	Fama-French Three-Factor Model with Review Return	Fama-French Five-Factor Model with Review Return
Alpha	N	N	N
R_m-R_f	+	+	+
SMB		N	N
HML		N	N
RMW			N
CMA			N

Table A2: One/Three/Five Factor Model (Simple Average, Time Series Regression)

	CAPM with Review Return	Fama-French Three-Factor Model with Review Return	Fama-French Five-Factor Model with Review Return
Alpha	N	N	N
R_m-R_f	+	+	+
SMB		+	+
HML		N	N
RMW			N
CMA			N

Table A3: One/Three/Five Factor Model (Weighted by Room Size, Panel Regression)

	CAPM with Review Return	Fama-French Three-Factor Model with Review Return	Fama-French Five-Factor Model with Review Return
Alpha	N	N	N
R_m-R_f	+	+	+
SMB		N	N
HML		N	N
RMW			N
CMA			N

Table A4: One/Three/Five Factor Model (Weighted by Room Size, Time Series Regression)

	CAPM with Review Return	Fama-French Three-Factor Model with Review Return	Fama-French Five-Factor Model with Review Return
Alpha	N	N	N
R_m-R_f	+	+	+
SMB		+	+
HML		N	N
RMW			N
CMA			N

Table A5: CAPM and FF Model with Review Return (Simple Average Weighting, Panel Regression)

	CAPM with Review Return	Fama-French Three-Factor Model with Review Return	Fama-French Five-Factor Model with Review Return
Alpha	N	N	N
R_m-R_f	+	+	+
Review Return	N	N	N
SMB		N	N
HML		N	N
RMW			N
CMA			N

Table A6: CAPM and FF Model with Review Return (Simple Average, Time Series Regression)

	CAPM with Review Return	Fama-French Three-Factor Model with Review Return	Fama-French Five-Factor Model with Review Return
Alpha	N	N	N
R_m-R_f	+	+	+
Review Return	N	N	N
SMB		N	N
HML		N	N
RMW			N
CMA			N

Table A7: CAPM and FF Model with Review Return (Weighted by Room Size, Panel Regression)

	CAPM with Review Return	Fama-French Three-Factor Model with Review Return	Fama-French Five-Factor Model with Review Return
Alpha	N	N	N
R_m-R_f	+	+	+
Review Return	N	N	N
SMB		N	N
HML		N	N
RMW			N
CMA			N

Table A8: CAPM and FF Model with Review Return (Weighted by Room Size, Time Series Regression)

	CAPM with Review Return	Fama-French Three-Factor Model with Review Return	Fama-French Five-Factor Model with Review Return
Alpha	N	N	N
R_m-R_f	+	+	+
Review Return	N	N	N
SMB		N	N
HML		N	N
RMW			N
CMA			N

Table A9: Moderating Role of Property Type (Simple Average Weighting)

	Fama-French Three-Factor Model with Review Return * Property Index		Fama-French Five-Factor Model with Review Return * Property Index	
	Panel Regression	Time Series Regression	Panel Regression	Time Series Regression
Alpha	N	N	N	N
R_m-R_f	+	+	+	+
Review Return*PI	N	N	N	N
SMB	N	+	N	+
HML	N	N	N	N
RMW			N	N
CMA			N	N

Table A10: Moderating Role of Property Type (Weighted by Room Size)

	Fama-French Three-Factor Model with Review Return * Property Index		Fama-French Five-Factor Model with Review Return * Property Index	
	Panel Regression	Time Series Regression	Panel Regression	Time Series Regression
Alpha	N	N	N	N
R_m-R_f	+	+	+	+
Review Return*PI	N	N	N	N
SMB	N	+	N	+
HML	N	N	N	N
RMW			N	N
CMA			N	N

Table A11: Moderating Role of Star Level under Scale Method 1 (Simple Average Weighting)

	Fama-French Three-Factor Model with Review Return * Star Level		Fama-French Five-Factor Model with Review Return * Star Level	
	Panel Regression	Time Series Regression	Panel Regression	Time Series Regression
Alpha	N	N	N	N
R_m-R_f	+	+	+	+
Review Return* Star Level	N	N	N	N
SMB	N	+	N	+
HML	N	N	N	N
RMW			N	N
CMA			N	N

Table A12: Moderating Role of Star Level under Scale Method 1 (Weighted by Room Size)

	Fama-French Three-Factor Model with Review Return * Star Level		Fama-French Five-Factor Model with Review Return Star Level	
	Panel Regression	Time Series Regression	Panel Regression	Time Series Regression
Alpha	N	N	N	N
R_m-R_f	+	+	+	+
Review Return* Star Level	N	N	N	N
SMB	N	+	N	+
HML	N	N	N	N
RMW			N	N
CMA			N	N

Table A13: Moderating Role of Star Level under Scale Method 2 (Simple Average Weighting)

	Fama-French Three-Factor Model with Review Return * Star Level		Fama-French Five-Factor Model with Review Return * Star Level	
	Panel Regression	Time Series Regression	Panel Regression	Time Series Regression
Alpha	N	N	N	N
R_m-R_f	+	+	+	+
Review Return* Star Level	N	N	N	N
SMB	N	+	N	+
HML	N	N	N	N
RMW			N	N
CMA			N	N

Table A14: Moderating Role of Star Level under Scale Method 2 (Weighted by Room Size)

	Fama-French Three-Factor Model with Review Return * Star Level		Fama-French Five-Factor Model with Review Return Star Level	
	Panel Regression	Time Series Regression	Panel Regression	Time Series Regression
Alpha	N	N	N	N
R_m-R_f	+	+	+	+
Review Return* Star Level	N	N	N	N
SMB	N	+	N	+
HML	N	N	N	N
RMW			N	N
CMA			N	N

Table A15: Moderating Role of Star Level under Scale Method 3 (Simple Average Weighting)

	Fama-French Three-Factor Model with Review Return * Star Level		Fama-French Five-Factor Model with Review Return * Star Level	
	Panel Regression	Time Series Regression	Panel Regression	Time Series Regression
Alpha	N	N	N	N
R_m-R_f	+	+	+	+
Review Return* Star Level	N	N	N	N
SMB	N	+	N	+
HML	N	N	N	N
RMW			N	N
CMA			N	N

Table A16: Moderating Role of Star Level under Scale Method 3 (Weighted by Room Size)

	Fama-French Three-Factor Model with Review Return * Star Level		Fama-French Five-Factor Model with Review Return Star Level	
	Panel Regression	Time Series Regression	Panel Regression	Time Series Regression
Alpha	N	N	N	N
R_m-R_f	+	+	+	+
Review Return* Star Level	N	N	N	N
SMB	N	+	N	+
HML	N	N	N	N
RMW			N	N
CMA			N	N

Table A17: Lagged Regression with Review Return (Simple Average, Panel Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return	N	N	N
SMB	N	N	N
HML	N	N	N

Table A18: Lagged Regression with Review Return (Simple Average, Time Series Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return	N	N	N
SMB	+	+	+
HML	N	N	N

Table A19: Lagged Regression with Review Return (Weighted by Room Size, Panel Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return	N	N	N
SMB	N	N	N
HML	N	N	N

Table A20: Lagged Regression with Review Return (Weighted by Room Size, Time Series Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return	N	N	N
SMB	+	+	+
HML	N	N	N

Table A21: Lagged Regression with Review Return*Star Level Under Scale Method 1 (Simple Average, Panel Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return*Star Level	N	N	N
SMB	N	N	N
HML	N	N	N

Table A22: Lagged Regression with Review Return*Star Level Under Scale Method 1 (Simple Average, Time Series Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return*Star Level	N	N	N
SMB	+	+	+
HML	N	N	N

Table A23: Lagged Regression with Review Return*Star Level Under Scale Method 1 (Weighted by Room Size, Panel Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return*Star Level	N	N	N
SMB	N	N	N
HML	N	N	N

Table A24: Lagged Regression with Review Return*Star Level Under Scale Method 1 (Weighted by Room Size, Time Series Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return*Star Level	N	N	N
SMB	+	+	+
HML	N	N	N

Table A25: Lagged Regression with Review Return*Star Level Under Scale Method 2 (Simple Average, Panel Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return*Star Level	N	N	N
SMB	N	N	N
HML	N	N	N

Table A26: Lagged Regression with Review Return*Star Level Under Scale Method 2 (Simple Average, Time Series Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return*Star Level	N	N	N
SMB	+	+	+
HML	N	N	N

Table A27: Lagged Regression with Review Return*Star Level Under Scale Method 2 (Weighted by Room Size, Panel Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return*Star Level	N	N	N
SMB	N	N	N
HML	N	N	N

Table A28: Lagged Regression with Review Return*Star Level Under Scale Method 2 (Weighted by Room Size, Time Series Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return*Star Level	N	N	N
SMB	+	+	+
HML	N	N	N

Table A29: Lagged Regression with Review Return*Star Level Under Scale Method 3 (Simple Average, Panel Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return*Star Level	N	N	N
SMB	N	N	N
HML	N	N	N

Table A30: Lagged Regression with Review Return*Star Level Under Scale Method 3 (Simple Average, Time Series Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return*Star Level	N	N	N
SMB	+	+	+
HML	N	N	N

Table A31: Lagged Regression with Review Return*Star Level Under Scale Method 3 (Weighted by Room Size, Panel Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return*Star Level	N	N	N
SMB	N	N	N
HML	N	N	N

Table A32: Lagged Regression with Review Return*Star Level Under Scale Method 3 (Weighted by Room Size, Time Series Regression)

	One month Lag	Two Month Lag	One quarter Lag
Alpha	N	N	N
R_m-R_f	+	+	+
Lagged Review Return*Star Level	N	N	N
SMB	+	+	+
HML	N	N	N